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is of considerable importance. That phase of the question, however, pertaining to flowering plants has been elsewhere treated. It remains to speak of the sanitary relations of the new and additional fact which has been established by the present experiments concerning odorous leaves as ozone-generators. Owing to the fact that few varieties which have markedly odorous leaves are cultivated within doors, their sanitary bearings may be regarded as being slight, the leaves of the geranium and other species usually seen in dwellings being feeble in their ozone-generating properties. Again, it should be remarked that when kept indoors the odors given off both from the flower and foliage are sometimes not only objectionable to the senses, but also may prove detrimental. It is evident that such plants should be discarded.

The case is widely different when we apply the results of our labors to the question of the hygienic value of out-door vegetation, and more particularly of pine groves. Under these circumstances unpleasant odors do not form a positive objection, whilst the species emitting the most pronounced odors are capable of rendering valuable hygienic service by furnishing ozone to the surrounding medium. Since the exhalations from the pine foliage are active agents in generating ozone, it follows that all of the important hygienic advantages of ozone are to be derived, to a marked degree, from the presence of pine woods.¹

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GLACIAL ORIGIN OF PRESQUE ISLE, LAKE ERIE.

BY T. DWIGHT INGERSOLL.

THE peninsula of Presque isle is an extension of the main land opposite the city of Erie, Pennsylvania, reaching out into Lake Erie in a north-eastern direction. It is crescentic in form, the convex portion facing the lake with the shore line bending toward the mainland, and forming Erie harbor, which is known also as Presque Isle bay. The bay is about four miles in length by about two in breadth, with an entrance on the east. Government operations have made the bay somewhat historical. The vessels of Commodore Perry's fleet were built here in 1813,

¹For a fuller discussion of the subject of the sanitary relations of pine forests, see article by J. M. Anders, on "Sanitary Influence of Forest Growth," a paper read before Phila. Go. Med. Society, Oct. 22, 1884.

and after his victorious battle the *Lawrence* and flag-ship *Niagara* lay in the bay until the centennial year, 1876, in front of the old block-house on Garrison hill, where General Anthony Wayne died and was buried in 1796.

When the peninsula was first occupied by Government soldiers it was several feet broad at the junction with the mainland and covered with large forest trees, but the constant action of waves, since that time, has reduced that portion to a narrow neck of land over which the waves have, during the past year, rolled into Presque Isle bay. There is a strong probability that before the expiration of the year this tract of land will be transformed into a traveling island en route to Niagara falls, unless something is done to protect it from lake storms. For a consideration of this matter there was a meeting of the Erie Board of Trade on January 5, 1885, at which Ex-judge John P. Vincent said:

"Since I came to Erie, in 1839, the north arm of the peninsula has moved several rods, and the east end extends fully a mile further than it did then. If something be not done the peninsula will waste away at the head and build up at the foot, and eventually the harbor will be below the city."

Engineers, however, have estimated the increase of land at the lower end to average only thirteen feet per annum. All this material—sand and pebbles—has been washed from the north shore, principally from that portion near the head, and when it reached the foot an eddy was formed around it, the sand falling to the bottom and becoming new-made land. Sometimes this material was carried past the peninsula too far for a union with the foot, and a bar and perhaps an island was formed, against which other sands lodged. At some subsequent time we may suppose that the eastern portion of the new formation was broken up by opposing easterly gales, and the sand carried along both sides of the new island toward the west until a union was formed with the peninsula, shutting in between the two connecting bars of sand a pond of water, and the island thereby became the foot of the peninsula, receiving further increase. In this way it is supposed that several fish-ponds, now in existence on the peninsula, have been formed.

From the briefly sketched history of Presque Isle the reader may naturally be led to inquire into its origin. The writer at one time imagined that there might have been a small uplift of rocks under the surface such as he had seen on the mainland in the

vicinity; but after a personal investigation and inquiry of civil engineers, he came to the conclusion that the land is composed entirely of sand, clay and rolled pebbles of foreign and native rocks.

History shows that this material has not only been changeable in form, but small quantities have from time to time been transported from the western to the eastern portion by the waves. These changes must have been in progress prior to its discovery, and of course the peninsula was situated further west than it is now. This we may regard as a clue to the origin of the peninsula however hypothetical it may seem to be. The material being almost identical with glacial drift that is scattered all over Northwestern Pennsylvania, which in some places is nearly 200 feet in depth, and may have had the same origin, having been deposited at the same time about twenty miles west of its present site, where the Devonian strata dip gently under the surface of the lake. At that point a vast quantity of glacial drift was shoved upon the sloping rocks during the ice age, and that deposit has been the sport of the waves ever since the retreat of the great northern glacier. Professor I. C. White, of the Pennsylvania State Geological Survey, says:

"The varied character of the northern drift deposits can be well studied along the shore of Lake Erie, towards the Ohio State line, where they constitute a terrace bluff from fifty to eighty feet high, out of which the waves are constantly removing the clay and fine sand into the lake leaving the coarse sand, pebbles and boulders to be daily rounded and polished on the beach."

At the close of the ice age the waves began to wash away the finer particles from the bluff of drift, and as the current of the water was down the lake in a north-eastern direction—the storms moving generally the same way—the probability is that a bar of sand was formed at some favorable place east of the starting point, upon which other material was driven year after year until an island or peninsula was formed. At some later period more powerful storms broke up the western portion and carried it along to or beyond the eastern extremity, while it was being constantly enlarged by sand from the original source, and from the bluffs and watershed along the shore, which was brought down by numerous streams. In this way let us imagine the bar became an island or a peninsula, and alternating perhaps with each other until the erratic bodies of land appeared to the first white settlers of this region in form of a peninsula.

ERIE, PA., AUGUST, 1885.